

## Claims

1. A system for generating waveforms, the system comprising:
- a memory configured to store a plurality of waveform segments, wherein each waveform segment comprises one or more waveform samples, wherein in response to receiving a request for one of the waveform segments, the memory is configured to output the requested waveform segment;
- a plurality of waveform segment queues each coupled to receive waveform segments output by the memory, wherein each waveform segment queue is configured to store a series of one or more waveform segments, wherein a first waveform segment queue is configurable to store a first series of one or more waveform segments, and wherein a second waveform segment queue is configurable to store a second series of one or more waveform segments;
- a selection unit coupled to each of the waveform segment queues, wherein the selection unit is configured to read waveform segments out of a selected one of the waveform segment queues, wherein the selection unit is configured to access the first waveform segment queue during a first time period, and wherein the selection unit is configured to access the second waveform segment queue if a first trigger occurs.
2. The system of claim 1, further comprising a plurality of control units each coupled to request waveform segments from the memory and each configured to parse a series of instructions, wherein the plurality of control units comprises a first control unit, wherein in response to parsing a first instruction to output a first waveform segment, the first control unit is configured to request the first waveform segment from the memory.

3. The system of claim 2, wherein in response to parsing a second instruction to repeat a first set of one or more instructions in the series of instructions, the first control unit is configured to repeatedly parse the first set of instructions.

5 4. The system of claim 3, wherein the second instruction indicates a number of times the first control unit should repeatedly parse the first set of instructions and a number of instructions in the first set of instructions.

10 5. The system of claim 3, wherein the first control unit is configured to maintain a first instruction read pointer that indicates which instruction in the series of instructions the first control unit should parse next, wherein in response to parsing the second instruction, the first control unit is configured to use a temporary instruction read pointer to repeatedly parse the first set of instructions instead of using the first instruction read pointer to repeatedly parse the first set of  
15 instructions.

6. The system of claim 2, wherein the first waveform segment queue is configured to receive and store the first waveform segment from the memory.

20 7. The system of claim 2, wherein the first control unit is coupled to the first waveform segment queue and configured to store information in the first waveform segment queue, wherein the information instructs the selection unit to cease accessing the first waveform segment queue if the first trigger occurs.

25 8. The system of claim 2, wherein the plurality of control units comprises a second control unit, wherein in response to parsing a second instruction to output a second waveform segment if the first trigger occurs, the second control unit is configured to request the second waveform segment from the memory.

9. The system of claim 8, further comprising an arbiter coupled between the memory and the first and second control units, wherein the arbiter is configured to arbitrate between the first and the second control unit's requests for waveform segments and to forward a selected request to the memory.

10. The system of claim 8, wherein the second waveform segment queue is configured to receive and store the second waveform segment from the memory.

11. The system of claim 8, wherein in response to parsing a third instruction to output a third waveform segment regardless of whether the first trigger occurs, both the first and the second control units are configured to request the third waveform segment from the memory.

12. The system of claim 1, further comprising a plurality of control units each coupled to request waveform segments from the memory and each configured to parse a series of instructions, wherein the plurality of control units comprises a second control unit, wherein the second control unit is configured to store information in the second waveform segment queue, wherein the information instructs the selection unit to access the second waveform segment queue if the first trigger occurs, and wherein the selection unit is configured to access the second waveform segment queue if the first trigger occurs in response to the information stored in the second waveform segment queue.

13. The system of claim 1, wherein the selection unit is configured to switch from accessing the first waveform segment queue to accessing the second waveform segment queue if the first trigger occurs.

14. The system of claim 1, wherein the memory comprises DRAM memory.

15. The system of claim 1, wherein the memory is configured to output data in bursts.

16. The system of claim 15, further comprising a decimator coupled between the memory and the plurality of waveform segment queues, wherein the memory is configured to output each burst of data to the decimator and the decimator is configured to discard a portion of the data that does not correspond to the requested waveform segment and to pass a remainder of the data to one of the waveform segment queues.

17. The system of claim 1, further comprising a digital-to-analog converter, wherein the digital-to-analog converter is coupled to receive an output series of waveform segments that is read out of the selected waveform segment queue by the selection unit and to convert the output series of waveform segments into an analog waveform.

18. The system of claim 1, wherein the selection unit is further configured to pause an output being read out of the first waveform segment queue by repeatedly reading a same waveform sample out of the first waveform segment queue until an indication to end the pause is received.

19. The system of claim 18, wherein the selection unit is further configured to pause the output being read out of the first waveform segment queue in response to a second trigger.

20. The system of claim 19, wherein selection unit is configured to pause the output being read out of the first waveform segment queue in response to detecting information contained at the head of the first waveform segment queue, wherein the information identifies the second trigger and instructs the selection unit to pause the output if the second trigger occurs.

21. The system of claim 1, further comprising a controller, wherein the controller is configured to request waveform segments from the memory and to store requested waveform segments in a first portion of the waveform segment queues so that each of the first portion of the waveform segment queues stores waveform segments for a respective thread.

22. The system of claim 21, wherein each thread is configured to generate a waveform that should be output if a certain trigger occurs.

23. The system of claim 22, wherein in response to the selection unit ceasing to access one of the first portion of the waveform segment queues, the controller is configured to initiate a new thread by storing waveform segments for the new thread in the waveform segment queue that is no longer being accessed by the selection unit.

24. The system of claim 1, wherein the selection unit is configured to wait until a first indication is provided from a host computer system before beginning to read waveform segments out of the selected waveform segment queue.

25. The system of claim 24, further comprising a controller configured to provide a second indication to the host computer system in response to each of a first portion of the waveform segment queues storing a first amount of waveform samples.

26. The system of claim 25, wherein the first indication is provided from the host computer system in response to the second indication being provided to the host computer system.

27. A method of generating a waveform, comprising:

retrieving a first waveform segment from a memory;  
storing the first waveform segment in a first queue;  
retrieving a second waveform segment from the memory;  
storing the second waveform segment in a second queue;  
5 reading the first waveform segment from the first queue; and  
if a first trigger occurs, reading the second waveform segment from the second  
queue;  
wherein each waveform segment comprises one or more waveform samples.

10 28. A method of generating a waveform, comprising:  
receiving a first instruction to output a first waveform segment;  
in response to said receiving the first instruction, retrieving the first waveform  
segment from a memory and storing the first waveform segment in a first  
queue;  
15 receiving a second instruction to output a second waveform segment if a first  
trigger occurs;  
in response to said receiving the second instruction, retrieving the second  
waveform segment from the memory and storing the second waveform  
segment in a second queue;  
20 reading the first waveform segment from the first queue; and  
if the first trigger occurs, reading the second waveform segment from the second  
queue;  
wherein each waveform segment comprises one or more waveform samples.

25 29. The method of claim 28, further comprising storing an indication in the  
first queue, wherein the indication indicates that no more waveform segments  
should be read from the first queue if the first trigger occurs.

30. The method of claim 28, further comprising providing an indication to initiate waveform generation, wherein said reading the first waveform segment occurs in response to said providing.

31. The method of claim 30, wherein said providing comprises providing the indication to initiate waveform generation in response to the first and the second queue each storing a first number of waveform samples.

32. The method of claim 28, further comprising providing the first waveform segment to a digital-to-analog converter.

33. The method of claim 32, further comprising providing an output of the digital-to-analog converter to a unit under test.

34. The method of claim 28, wherein said retrieving the first waveform segment from a memory comprises receiving one or more bursts of data from the memory.

35. The method of claim 34, wherein said retrieving the first waveform segment from the memory comprises discarding a portion of the data received in a first burst from the memory, wherein the discarded portion of the data does not define the first waveform segment.

36. The method of claim 28, further comprising:  
receiving a third instruction to output a third waveform segment regardless of whether the first trigger occurs; and  
in response to said receiving the third instruction, retrieving the third waveform segment from the memory and storing the third waveform segment in the first queue and in the second queue.

37. The method of claim 28, wherein the memory comprises DRAM memory.

38. The method of claim 28, further comprising pausing an output being read out of the first queue by repeatedly reading a same waveform sample out of the first queue until an indication to stop pausing the output is received.

39. The method of claim 38, wherein said pausing comprises pausing the output in response to a second trigger.

40. The method of claim 39, wherein said pausing comprises pausing the output in response to detecting information contained at the head of the first queue, wherein the information identifies the second trigger and that the output should be paused if the second trigger occurs.

41. The method of claim 28, wherein both the first and second queue store waveform segments for a respective thread.

42. The method of claim 41, wherein each thread defines a waveform that should be output if a certain trigger occurs.

43. The method of claim 42, further comprising initiating a new thread that defines a new waveform that should be output if a second trigger occurs and storing the waveform segments for the new waveform in the first queue in response to said reading the second waveform sample from the second queue.

44. A system configured to generate one or more waveform output streams, the system comprising:  
a memory configured to store a plurality of waveform segments, wherein each waveform segment comprises one or more waveform samples;



a plurality of queues, wherein each queue is coupled to receive waveform segments from the memory, wherein each queue is configured to store a series of waveform segments for a respective one of the waveform output streams; and

5 one or more output interfaces, wherein each output interface is coupled to read waveform segments from at least one of the waveform segment queues that stores waveform segments for a respective one of the waveform data streams.

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Accepted for filing